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THE BRYOLOGIST

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No. 4

ILLUSTRATED KEY TO THE WESTERN DITRICHACEAE¹

T. C. FRYE

KEY AND COMPARISON OF THE GENERA

- 1a. Seta .4–1 mm. long, not projecting above the upper leaves; lid none; peristome none; (2) leaves not 2-ranked; (3) teeth none; (4) leaves ovate or lanceolate at base, subulate or mucronate at tip; capsule ovoid-apiculate, not strumose, not grooved; (5) leaves not glaucous, not circinate nor secund.

1. PLEURIDIUM

- 1b. Seta 5–40 mm. long, usually projecting above the upper leaves; lid present; peristome of 16 often split or perforate teeth.

- 2a. Leaves 2-ranked; (3) teeth perforate to regularly bifid or trifid, the joints not thickened; (4) leaves subulate from a broader base; capsule cylindric or ovoid, not strumose, not grooved; (5) leaves not glaucous, not circinate nor secund.

2. SWARTZIA

- 2b. Leaves not 2-ranked.

- 3a. Teeth regularly bifid, the joints thickened.

- 4a. Leaves subulate; capsule narrowly cylindric, not strumose, not grooved; (5) leaves not glaucous, circinate.

3. TRICHODON

- 4b. Leaves lanceolate or mucronate; capsule ovoid, strumose, grooved; (5) leaves not glaucous, not circinate nor secund.

4. CERATODON

- 3b. Teeth irregularly split, slender, papillose, the joints not thickened; (4) leaves lanceolate to subulate; capsule ovoid to cylindric, not strumose, smooth or slightly grooved.

- 5a. Leaves glossy, often secund and subulate.

5. DITRICHUM

- 5b. Leaves glaucous with a waxy bloom, not secund.

6. SÆLANIA

KEY TO THE GENERA, BASED ON VEGETATIVE PLANTS

- A. Leaves glaucous with a white-filamentous or granular dorsal surface; cells of leaf-apex quite long and narrow in the lower leaves.

6. SÆLANIA

- AA. Leaves not glaucous; cells of leaf-apex shorter for the width than in A.

- B. Leaves lanceolate, not subulate, green but not glossy; cells of the leaf-middle isodiametric.

4. CERATODON

- BB. Leaves lanceolate-subulate or narrower; most species but not all with cells of leaf-middle 2 or more times as long as wide.

- C. Leaves 2-ranked; cells of the leaf-middle irregular.

2. SWARTZIA

- CC. Leaves not 2-ranked.

- D. Cells of the leaf-middle irregular or roundish or square.

5. DITRICHUM

¹ Geographically this paper covers the region from the Rocky Mountains to the Pacific Ocean from Mexico to the Arctic Ocean. The aim has been to make useful what is already known, rather than add to our knowledge of the group. The work of E. G. Britton in "North American Flora" has been specially helpful.

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- DD. Cells of the leaf-middle 2 or more times as long as wide.
 E. Cells of the leaf-base 5-8 times as long as wide; marginal cells of leaf-apex mostly 1-2 times as long as wide. 3. TRICHODON
 EE. Cells of the leaf-base 1-5 times as long as wide; marginal cells of apex longer than in E.
 F. Leaves 3-7 mm. long. 5. DITRICHUM SCHIMPERI
 FF. Leaves 1-3 mm. long.
 G. Leaves abruptly narrowed. 5. DITRICHUM HETEROMALLUM
 GG. Leaves gradually narrowed.
 H. Stems 2-5 mm. long; cross section of leaf-vein with 2 rows of guide cells. 1. PLEURIDIUM
 HH. Stems 10-20 mm. long; cross section of leaf-vein with 1 row of guide cells. 5. DITRICHUM

1. PLEURIDIUM

Plants in low dense cushions. Leaves not crispate when dry, entire or minutely serrulate; vein filling most of the awn, usually rough. Calyptra cucullate. Seta very short. Capsule immersed, ovoid; lid none; peristome none; spores brown, rough.—(Gk. *pleuridion* = on one side; because the capsule occasionally appears to arise laterally on the stem.)

- 1a. Vein rough at tip only; paroicous; perichaetial leaves gradually subulate; spore surface finely granular.

*Pleuridium bolanderi*² C. Müll.—Wash. to Calif.

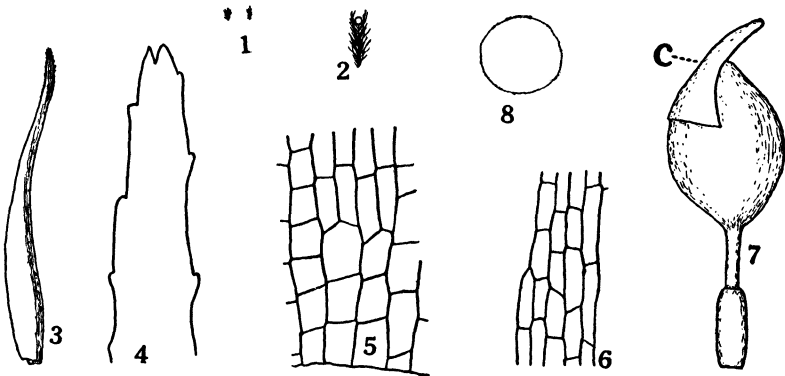


PLATE IV.—*Pleuridium bolanderi*

(1) Plants, $\times 1$. (2) Plants, $\times 3$ (3) Leaf, $\times 32$. (4) Leaf-tip, $\times 400$. (5) Cells from leaf-base, $\times 400$. (6) Cells from leaf-middle, $\times 400$. (7) Capsule; c, calyptra; (after Cardot and Thériot) \times about 13. (8) Spore, $\times 550$.

- 1b. Vein rough some distance down from the tip; autoicous; perichaetial leaves abruptly subulate; spore surface densely papillose.

Pleuridium alternifolium Brid.—Calif.; Kan. and eastward in the U. S.

² *P. stramineum* Lesq.; *P. alternifolium howei* R. & C.; *P. bakeri* C. & Th.

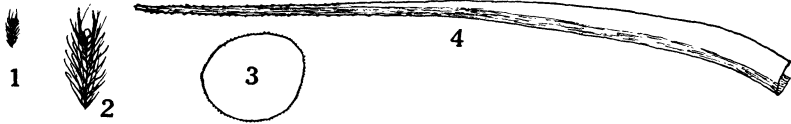


PLATE V.—*Pleuridium alternifolium*

(1) Plant, $\times 1$. (2) Plant, $\times 3$. (3) Spore, $\times 550$. (4) Leaf, $\times 32$.

2. *SWARTZIA* (*Cynodontium*, *Distichium*)

Plants in dense matted tufts. Stem dichotomous, tomentose. Leaves in 2 ranks, not crowded; vein excurrent in the awn. Calyptra cucullate. Seta pale yellow, long, slender, twisted. Capsule small; lid conic; peristome single, divided to base; teeth 16, perforate or split. Spores rough.—(Honor of Olaf Swartz, an 18th-century botanist.)

1a. Leaves very rough at apex; capsule erect, cylindric, about 3-4 times as long as wide.

*Swartzia montana*³ (Lam.) Lindb.—Arctic America to Wash. and Ariz.; northeastern N. Amer.

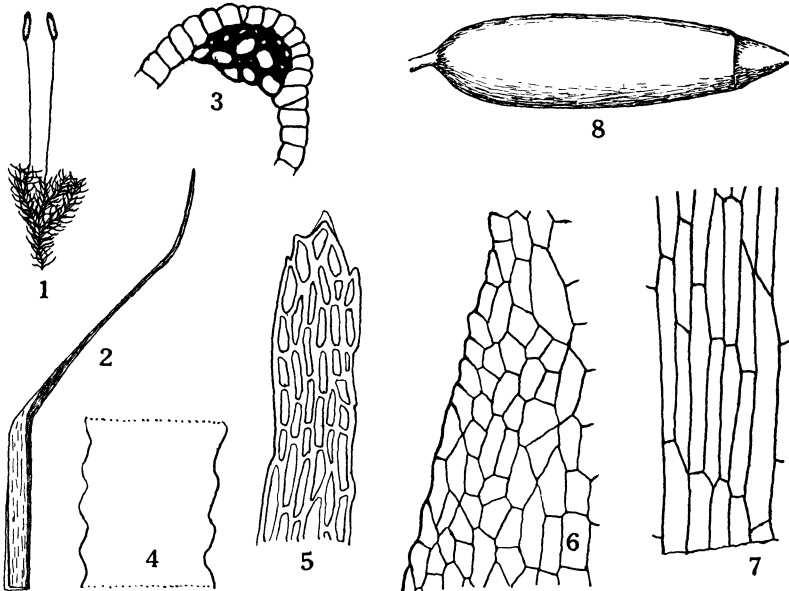


PLATE VI.—*Swartzia montana*

(1) Plant, $\times 1$. (2) Leaf, $\times 18$. (3) Cross section of leaf-vein, $\times 400$. (4) Portion of subula about its middle, $\times 400$. (5) Leaf-tip, $\times 400$. (6) Cells of leaf-middle, $\times 400$. (7) Cells of leaf-base, $\times 400$. (8) Capsule, $\times 22$.

³ *Distichium capillaceum* B. S. G.

- 1b. Leaves slightly rough at apex; capsule inclined, ovoid, about 2–2.5 times as long as wide.

*Swartzia inclinata*⁴ Hedw.—Calif.; Mont. to Utah and Colo.; north-eastern N. Amer.

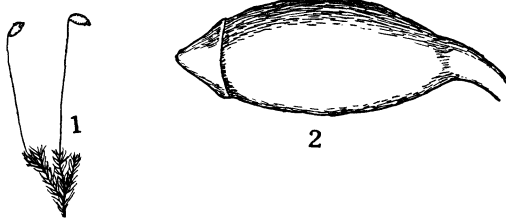


PLATE VII.—*Swartzia inclinata*

(1) Plant, $\times 1$. (2) Capsule, $\times 22$.

3. TRICHODON

Stem slender, 3-angled. Leaves not crowded, not 2-ranked, sheathing, reflexed, awned, serrulate. Calyptra cucullate. Seta slender. Capsule narrowly ovoid or cylindric, straight or slightly curved; lid conic-rostrate; peristome single; teeth 16, slender, papillose, bifid almost to base, thick-jointed. Spores smooth.—(Gk. *thrix* = hair; *odous* = a tooth; referring to the long, thin teeth of the peristome.)

- 1a. Seta 10–15 mm. long; capsule narrowly cylindric.

*Trichodon tenuifolius*⁵ (Schr.) Lindb.—Yukon to Wash, Nev. and Mont.

- 1b. Seta 5–7 mm. long; capsule ovoid-cylindric.

Trichodon borealis Wms.—Known only from Dawson, Yukon.

4. CERATODON

Plants matted together with rhizoids, green, not glossy. Stem 3–5 angled. Leaves small, ovate-lanceolate, acuminate or subulate; cells isodiametric. Calyptra cucullate. Set purple or yellow, slender. Capsule exserted, small, somewhat sulcate when dry, abrupt at base, with goitre; lid conic-rostrate; peristome single; teeth 16, split nearly to base, nodose. Spores small.—(Gk. *keras* = a horn; *odous* = a tooth; the teeth of the peristome suggested the horns of a goat.)

- 1a. Leaf-vein usually not or hardly excurrent; seta purple; capsule from inclined to horizontal, 2.5–3.5 times as long as wide exclusive of lid.

*Ceratodon purpureus*⁶ (L.) Brid.—Cosmopolitan.

- 1b. Leaf-vein strongly excurrent; seta yellow or red; capsule usually erect, about twice as long as wide exclusive of lid.

*Ceratodon conicus*⁷ (Hampe) Lindb.—Alaska to Wash. and Idaho; Minn.

⁴ *Distichium inclinatum* B. S. G.

⁵ *Trichostomum tenuifolium* Schrad; *Trichostomum cylindricum* Hedw.; *Trichodon cylindricus* Schimp.

⁶ *C. heterophyllus* Kindb.; *C. columbiae* Kindb.

⁷ *Trichostomum conicum* Hampe; *Ceratodon minor* Aust.

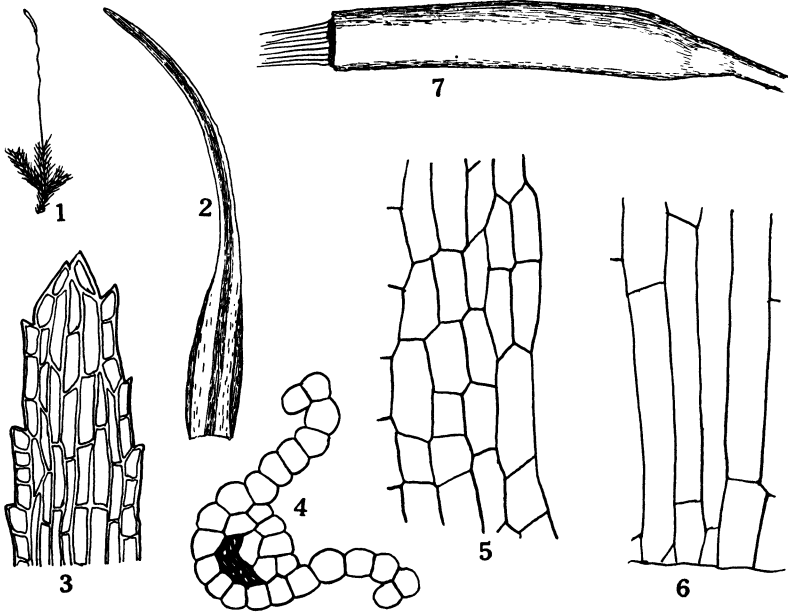


PLATE VIII.—*Trichodon tenuifolius*

(1) Plant, $\times 1$. (2) Leaf, $\times 18$. (3) Leaf-tip, $\times 400$. (4) Cross section leaf-vein, $\times 400$. (5) Cells of leaf-middle, $\times 400$. (6) Cells of leaf-base, $\times 400$. (7) Capsule, $\times 22$.

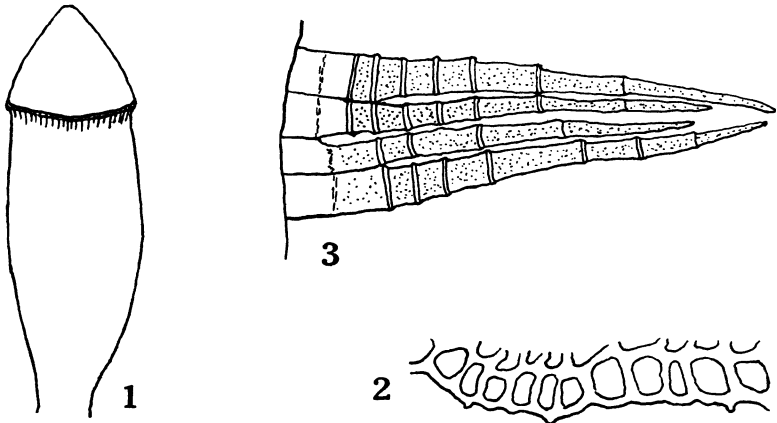


PLATE IX.—*Trichodon borealis*

(1) Capsule, $\times 50$. (2) Part of base of lid, $\times 270$. (3) Portion of the peristome, $\times 270$.—(After R. S. Williams.)

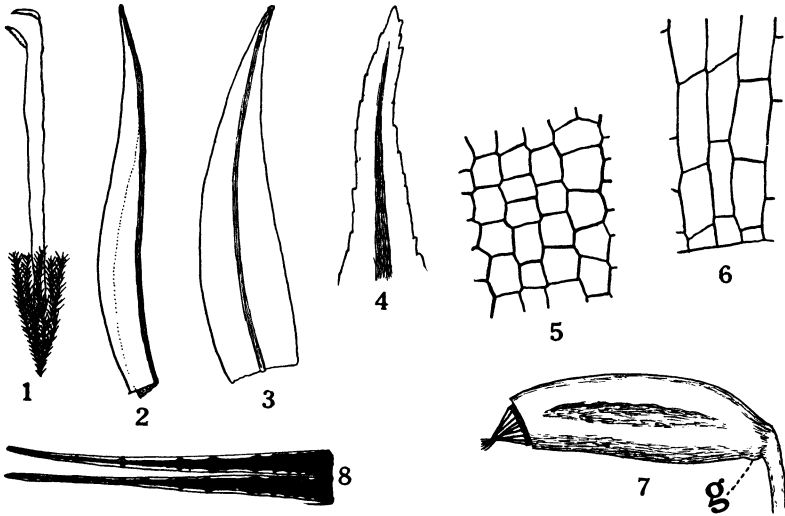


PLATE X.—*Ceratodon purpureus*

(1) Plant, $\times 1$. (2) Leaf, $\times 44$. (3) Leaf, $\times 44$. (4) Leaf-tip, $\times 125$. (5) Cells of leaf-middle, $\times 400$. (6) Cells of leaf-base, $\times 400$. (7) Capsule; g, goitre, $\times 18$. (8) A split tooth of the peristome, $\times 125$.

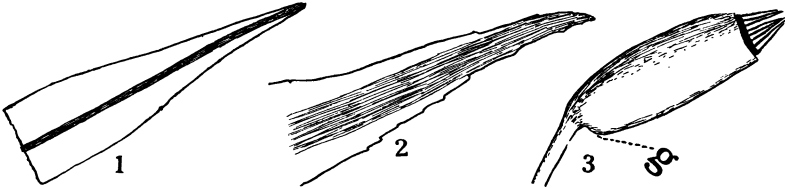


PLATE XI.—*Ceratodon conicus*

(1) Leaf, 1. \times (2) Leaf-tip, $\times 125$. (3) Capsule; g, goitre, $\times 18$.

5. DITRICHUM (*Leptotrichum*)

Stem usually short, sparingly branched. Leaves not 2-ranked, lanceolate or subulate, entire or serrulate. Cells at leaf-base rectangular, not enlarged in basal angles; tip cells mostly narrow. Calyptra cucullate. Seta slender, erect, twisted. Capsule erect, ovoid or cylindric; lid conic to rostrate; teeth 16, split nearly to base, slender, nodose, smooth or papillose. Spores small.—(Gk. *di* = 2; *thrix* = hair; because the teeth of the peristome are commonly split into 2 hair-like parts.)

1a. Leaves 3–7 mm. long, only the shorter remaining 3 mm.

- 2a. Marginal 2 or more rows of cells at leaf-middle irregular; (3) leaf-margin incurved, serrulate; (4) seta pale red, 3-3.5 cm. long; (5) stems up to 150 mm. long.

*Ditrichum giganteum*⁸ Wms.—Yukon to Mont.; Mich., Minn.

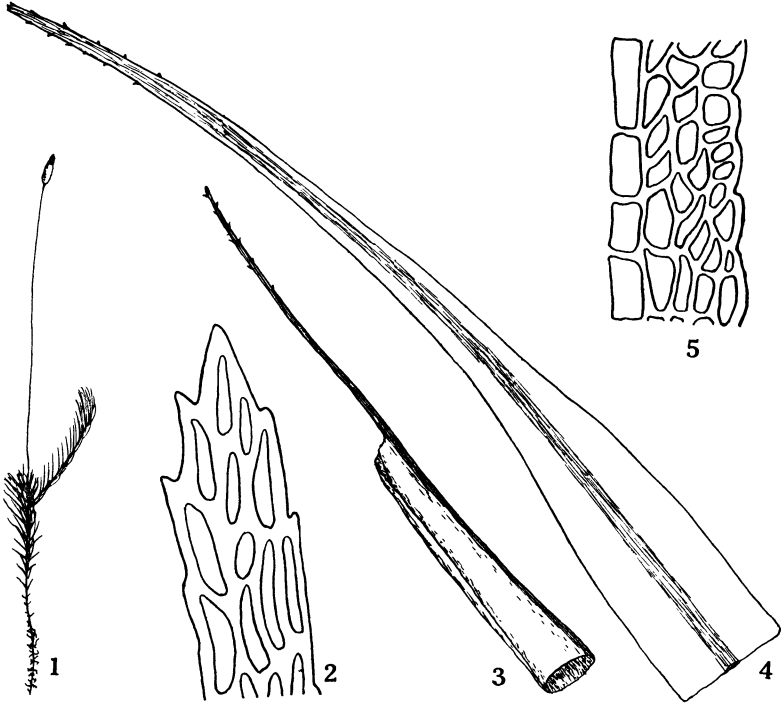


PLATE XII.—*Ditrichum giganteum*

(1) Plant, \times about 1. (2) Leaf-tip, \times about 350. (3) Perichaetial leaf, \times about 18. (4) Leaf, \times about 22. (5) Cells of leaf-middle, \times about 350.—(After R. S. Williams.)

- 2b. Marginal 2 or more rows of cells at leaf-middle rectangular, 2-8 times as long as wide; (3) leaf-margin incurved, entire to faintly serrulate; (4) seta pale yellow, 1-2 cm. long; (5) stems up to 5 mm. long; spores $21-27 \mu$, in all our other species 14μ or less.

*Ditrichum schimperi*⁹ (Lesq.) Paris—B.C. to Calif.

- 1b. Leaves 1-3 mm. long, only the longer reaching 3 mm.

- 2a. Marginal 2 or more rows of cells at leaf-middle isodiametric or nearly so, irregular; (3) leaf-margin incurved, entire or with a few teeth

⁸ *D. flexicaule longifolium* Hag.

⁹ *Leptotrichum schimperi* Lesq.

near the tip; (4) seta red below, paler above, 1–2 cm. long; (5) stems up to 100 mm. long.

*Ditrichum flexicaule*¹⁰ (Schwaegr.) Hampe—Alaska to B.C.; north-eastern N. Amer.

- 2b. Marginal 2 or more rows of cells at leaf-middle square or nearly so, not irregular; (3) leaf-margin incurved, serrulate above; (4) seta pale yellow, 1.5–2.5 cm. long; (5) stems up to 10 mm. long.

Ditrichum montanum Leib.—Wash. and Idaho.

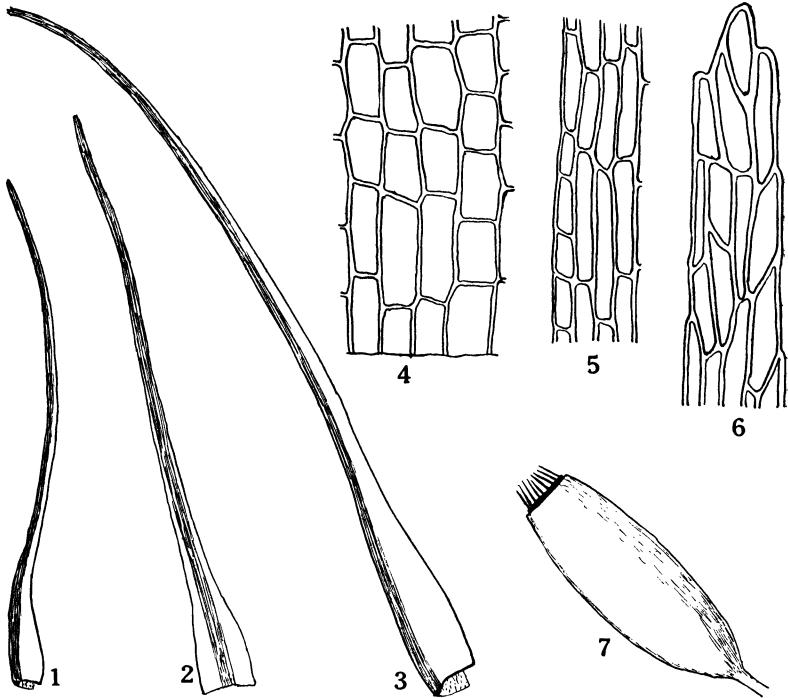


PLATE XIII.—*Ditrichum* Schimper

- (1) Leaf, $\times 22$. (2) Leaf, $\times 22$. (3) Leaf, $\times 22$. (4) Cells of leaf-base, $\times 400$
(5) Cells of leaf-middle, $\times 400$. (6) Leaf-tip, $\times 400$. (7) Capsule, $\times 18$.

- 2c. Marginal 2 or more rows of cells at leaf-middle rectangular and about 2–4 times as long as wide.

- 3a. Leaves not revolute, almost entire, abruptly narrowed; (4) seta dark red, 1–2.5 cm. long; (5) stems up to 10 cm. long.

¹⁰ *Trichostomum flexicaule* B. & S.; *Distichum macounii* Müll.; *Leptotrichum flexicaule brevifolium* Kindb.; *Ditrichum brevifolium* Paris; *Ditrichum flexicaule brevifolium* Barnes; *Ditrichum elatum* Kindb.

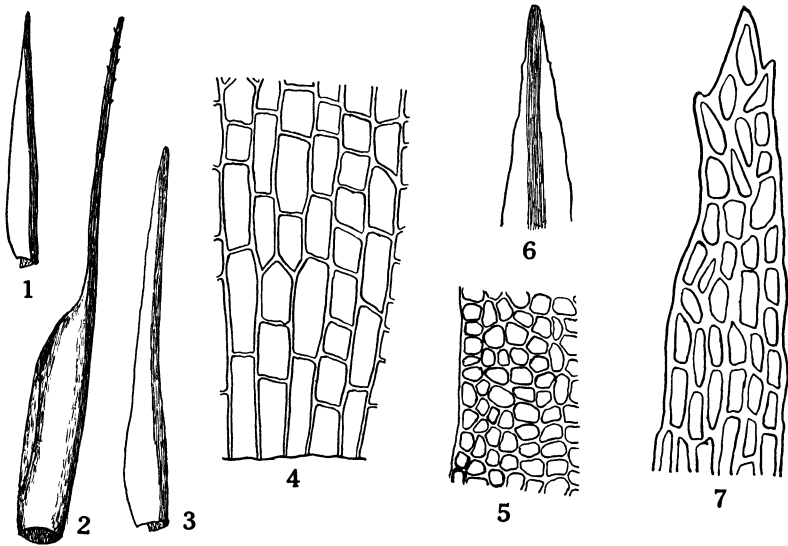


PLATE XIV.—*Ditrichum flexicaule*

(1) Leaf, $\times 22$. (2) Perichaetial leaf, $\times 22$. (3) Leaf, $\times 22$. (4) Cells of leaf-base, $\times 400$. (5) Cells of leaf-middle, $\times 400$. (6) Leaf-tip, $\times 32$. (7) Leaf-tip, $\times 400$.

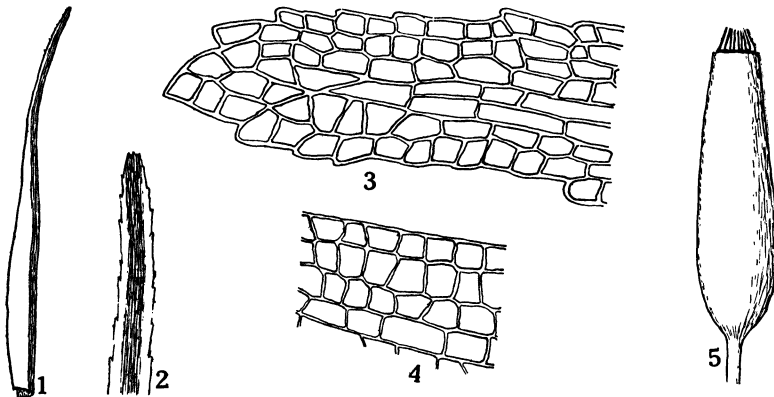


PLATE XV.—*Ditrichum montanum*

(1) Leaf, $\times 22$. (2) Leaf-tip, $\times 32$. (3) Leaf-tip, $\times 400$. (4) Cells of leaf middle, $\times 400$. (5) Capsule, $\times 18$.

*Ditrichum heteromallum*¹¹ (Hedw.) E. G. B.—Alaska to Oreg.; N. H.

3b. Leaves somewhat revolute, gradually narrowed; (4) seta red, 1–2 cm. long; (5) stems up to 10–20 mm. long.

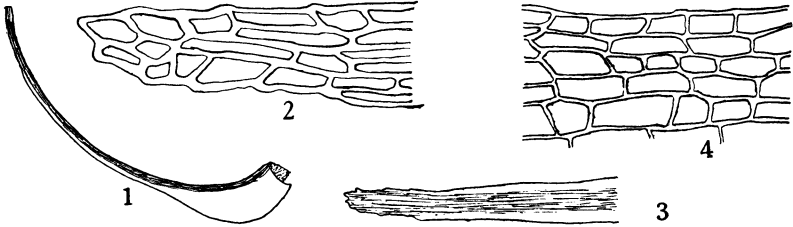


PLATE XVI.—*Ditrichum heteromallum*

(1) Leaf, $\times 22$. (2) Leaf-tip, $\times 400$. (3) Leaf-tip, $\times 32$. (4) Cells of leaf-middle, $\times 400$.

4a. Peristome-teeth bifid to base, not connate nor perforate; leaf-tip wide; basal marginal leaf-cells short.

Ditrichum ambiguum Best—Wash. and Oreg.

4b. Peristome-teeth not bifid to base, more or less connate or perforate; leaf-tip narrow; basal marginal leaf-cells long.

*Ditrichum pusillum*¹² (Hedw.) Timm.—Wash., Calif.; eastern N. Amer.

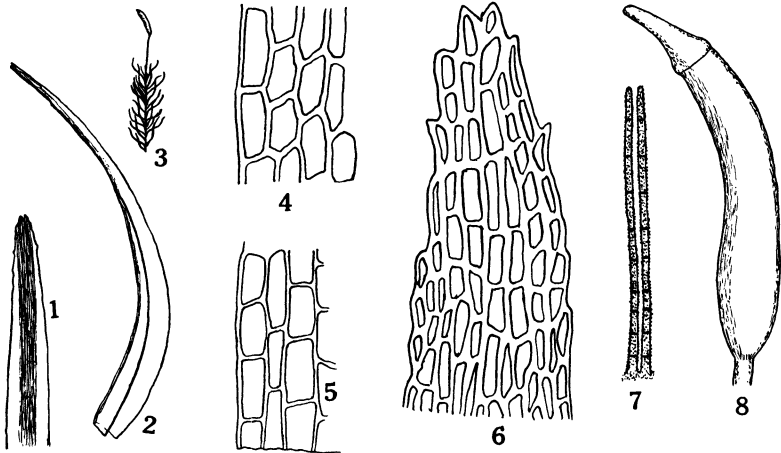


PLATE XVII.—*Ditrichum ambiguum*

(1) Leaf-tip, $\times 32$. (2) Leaf, $\times 22$. (3) Plant, $\times 1$. (4) Cells of leaf-middle, $\times 400$. (5) Cells of leaf-base, $\times 400$. (6) Leaf-tip, $\times 400$. (7) A split tooth of the peristome, $\times 125$. (8) Capsule, $\times 18$.

¹¹ *Ditrichum homomallum* Hampe; *Trichostomum heteromallum* Lindb.

¹² *Leptotrichum pusillum* Hampe; *Ditrichum tortile* Müll.; *Leptobarbula berica* Mac.

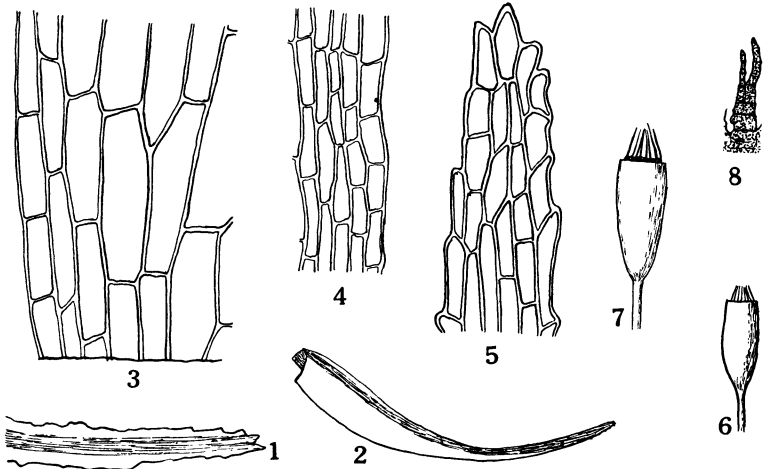


PLATE XVIII.—*Ditrichum pusillum*

(1) Leaf-tip, $\times 32$. (2) Leaf, $\times 22$. (3) Cells of leaf-base, $\times 400$. (4) Cells of leaf-middle, $\times 400$. (5) Leaf-tip, $\times 400$. (6) Capsule, $\times 18$. (7) Capsule, $\times 18$. (8) Tooth of peristome, $\times 125$.

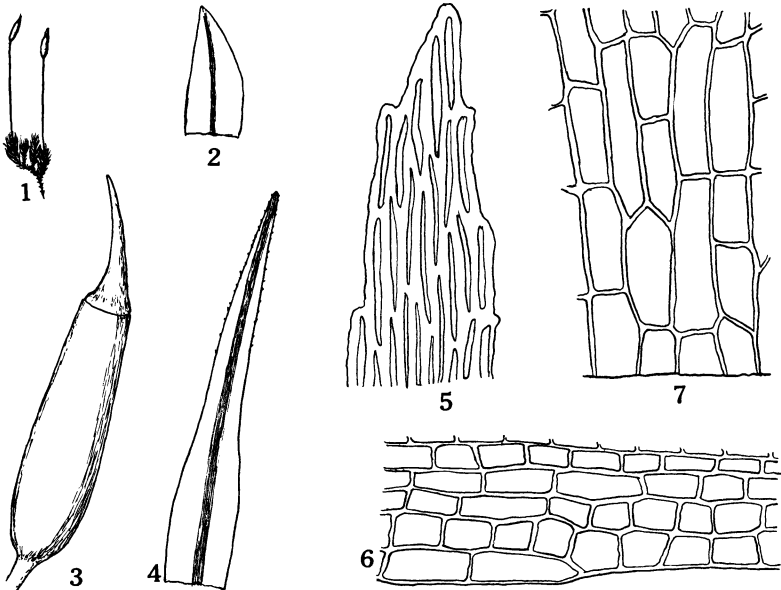


PLATE XIX.—*Saelania glaucescens*

(1) Plant, $\times 1$. (2) Leaf, $\times 22$. (3) Capsule, $\times 18$. (4) Leaf, $\times 22$. (5) Leaf-tip, $\times 400$. (6) Cells of leaf-middle, $\times 400$. (7) Cells of leaf-base, $\times 400$.

6. SÆLANIA

Stems bluntly triangular in cross section. Leaves linear-lanceolate, serrate, glaucous, with white-filamentous or granular dorsal surface; vein extending to apex. Calyptra cucullate. Seta erect. Capsule exserted, ovoid-cylindric, erect, smooth or slightly furrowed when dry; lid conic; annulus single; peristome-teeth 16, split, nodose, papillose. Spore small, papillose.—(Honor of Sælan, a Scandinavian bryologist.) We have only the following species.

*Sælania glaucescens*¹³ (Hedw.) Broth.—Alaska to B.C.; northern N. Amer.

UNIVERSITY OF WASHINGTON, SEATTLE

PRELIMINARY LIST OF ARIZONA HEPATICÆ¹

ALEXANDER W. EVANS

Very few species of Hepaticæ have been reported from Arizona. The first records for the state were made in 1895 by Underwood,² who noted the occurrence of *Marchantia polymorpha* and *Reboulia hemisphaerica*, without citing definite stations. Four additional species have since been reported by the writer, as follows: *Plagiochasma rupestre* and *P. Wrightii*, in 1915;³ *Frullania mexicana*, also in 1915;⁴ and *Marchantia paleacea*, in 1917.⁵ Of these six species, *Marchantia paleacea*, although not endemic to Arizona, is known from no other stations in the United States.

The following list is based largely on the collections made by G. E. Nichols, while participating in the International Phytogeographic Excursion in America. This has been supplemented by the material in the herbarium of the New York Botanical Garden and by specimens kindly communicated by W. A. Cannon, D. S. Johnson, F. Shreve, and J. J. Thornber. Although future collections will undoubtedly lengthen the list appreciably, it is hardly to be expected that many conspicuous species remain to be discovered.

1. RICCIA GLAUCA L. Bear Canyon, Santa Catalina Mountains, 1913, *G. E. Nichols*.

2. RICCIA SOROCARPA Bisch. Cherry Creek, Santa Catalina Mountains, 1913, *G. E. Nichols*; summit of Mt. Lemmon, Santa Catalina Mountains, *F. Shreve*.

3. RICCIELLA FLUITANS (L.) A. Br. Soldier Canyon, Santa Catalina Mountains, 1913, *G. E. Nichols*; Sabino Canyon, Santa Catalina Mountains, *F. Shreve*.

4. TARGIONIA HYPOPHYLLA L. Bright Angel Trail, bottom of Grand Canyon, 1913, *G. E. Nichols*; Sabino Canyon, Santa Catalina Mountains, *J. J. Thornber*; Miller Canyon, Huachuca Mountains, *F. Shreve*.

¹³ *Sælania caesia* Lindb.; *Ditrichum glaucescens* Hampe.

¹ Contribution from the Osborn Botanical Laboratory.

² Bot. Gaz. **20**: 69, 70. 1895.

³ Bull. Torrey Club **42**: 279, 295. 1915.

⁴ BRYOLOGIST **18**: 88. 1915.

⁵ Trans. Connecticut Acad. **21**: 254. 1917.